

REMARKS

With the present amendment, claims 1, 8, 9 and 10 have been amended. Claim 12 is new. The claims now pending are 1-12.

REGARDING REJECTIONS UNDER 35 U.S.C. 112, 1st PARAGRAPH

Re: "The proviso "when the halocarbon is 1,1,1-trifluoroethane(HFC-143a) the alcohol may not be an alcohol" is nowhere in the specification"

This proviso has been deleted from claim 1.

REGARDING REJECTIONS UNDER 35 U.S.C. 112, 2nd PARAGRAPH

Re: "a. It is unclear how a mere contracting step in claim 1, e.g., the contacting of the first mixture with an extractive agent produces a second mixture; and what constitute the second mixture formed from the contacting step and later being extractively distilled within the context of the claimed invention."

Referring to certain paragraph numbers in the patent application publication (US 2003/0116422) of the present application, paragraph [0031] describes extractive distillation and paragraphs [0045] through [0047] and [0053] describe the contacting step and the second mixture.

Re: "b. It is not clear whether the "at least one halocarbon of the second mixture" in claim 1, lines 6-7 from the bottom, different or the same as the initially recited "halocarbon" in claim 1, lines 2-5."

The "at least one halocarbon of the second mixture" is the same as "the initially recited "halocarbon"". Applicant has amended this passage of claim 1 for clarification as follows:

"... separating difluoromethane (HFC-32) from said at least one halocarbon ~~of the second mixture~~ by ~~extractively~~ distilling the second mixture..."

Re: "c. What constitute the extractive distillation agent in the step of "extractively distilling the second mixture" and the products produced of this step? They should be recited in the claims for completeness."

Applicant has amended this passage of claim 1 for clarification as follows:

"... separating difluoromethane (HFC-32) from said at least one halocarbon ~~of the second mixture~~ by ~~extractively~~ distilling the second mixture, and recovering difluoromethane (HFC-32) substantially free of said at least one halocarbon, and recovering said extractive agent,

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The second mixture is formed by "... contacting the first mixture with an *extractive agent*..." (italicized here for emphasis). The second mixture is distilled, thus, it is clear that said *extractive agent* is the extractive distillation agent in this distilling step.

Re: "d. The extractive agent, recited in claim 8, lacks antecedent support."

Claims 1 and 8 have been amended to clarify the aspect of recycling extractive agent.

Re: "e. An azeotrope is normally defined by its composition and pressure parameters. The parameters are not specified in claim 11."

The "composition and pressure parameters" of the azeotropes covered by claim 11 are known in the prior art.

Applicant respectfully argues that the claim language meets the threshold requirements of clarity and precision and that the claimed subject matter is defined with a reasonable degree of particularity and distinctness such that one possessing the ordinary level of skill in the pertinent art at the time the invention was made would find the claims definite. Applicant requests removal of the rejections under 35 U.S.C. 112, 1st and 2nd paragraphs.

REJECTIONS UNDER 35 U.S.C. 102(b,e) AND 35 U.S.C 103(a)

Re: "Claims 1-4 are rejected under 35 U.S.C. 102(b,e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Mahler et al or XP000446558 US (GB) document."

"Mahler et al" is U.S. 5,830,325. "XP000446558 US (GB) document" is Research Disclosure 36,015, April 1994, pp. 191-193, "Methods for Separating Chloro-Carbons from Hydrofluoroalkanes".

The examiner states "*Mahler is applied for the same reasons as set forth at page 4 of the previous office action. The above document discloses the used of hydrocarbon as the agent in an extractive distillation process.*"

Mahler et al. discloses separating HFC-143a from certain impurities, including CFC-115, HFC-125, CFC-12, HCFC-1113 and HFC-32 by extractive distillation using an alcohol extractive agent (Mahler et al., col. 4, lines 13-22). Mahler makes no mention of extractive agents other than alcohols. Claim 1 of the subject application relates to separating HFC-32 from a halocarbon selected from the group consisting of CFC-12, CFC-115, and HFC-125 using certain alcohol, hydrocarbon, ketone or chlorocarbon extractive agents. Mahler et al. is silent regarding separation of HFC-32 from CFC-12, CFC-115 or HFC-125 by extractive distillation using any extractant, much less an alcohol extractant. Thus, the present claims 1-4 are not anticipated by Mahler et al.

At the time the present invention was made, there was no suggestion or motivation to modify the teachings in Mahler et al. to arrive at separation of HFC-32 from CFC-12, CFC-115

or HFC-125 by extractive distillation using an alcohol extractant, much less any reasonable expectation that such an extractive distillation would be successful. The teachings of Mahler et al. are not sufficient for one of ordinary skill in this field to realize the present invention without lengthy research and independent conception. Mahler et al. does not disclose the relative volatilities between HFC-32 and any of CFC-12, CFC-115 and HFC-125 in the presence of any of the presently claimed extractive agents. Relative volatilities of the combination of HFC-32 with other compounds are not predictable but through experimentation and are required for one of ordinary skill in the art to determine if a specific extractant will perform a desired separation. Thus, the present claims 1-4 are not rendered obvious by Mahler et al.

Research Disclosure 36,015, April 1994, pp. 191-193, discloses a process for separating "chloro-carbon" from HFC-134a by extractive distillation using an extractant selected from trichloroethylene, perchloroethylene, carbon tetrachloride and aliphatic hydrocarbons containing from 4 to 20 carbon atoms (Research Disclosure 36,015, April 1994, page 191, left hand column, 4th paragraph). The chloro-carbons are defined generically as chlorofluorocarbons and hydrochlorofluorocarbons (Research Disclosure 36,015, April 1994, page 191, left hand column, 1st paragraph) and named are the "chloro-methanes" CFC-12, CFC-13, CFC-11 and HCFC-22 (Research Disclosure 36,015, April 1994, page 193, left hand column, 2nd paragraph).

At the time the present invention was made, there was no suggestion or motivation to modify the teachings in Research Disclosure 36,015, April 1994, pp. 191-193, to arrive at separation of HFC-32 from CFC-12, CFC-115 or HFC-125 by extractive distillation using an alcohol extractant, much less any reasonable expectation that such an extractive distillation would be successful. The teachings of Research Disclosure 36,015, April 1994, pp. 191-193, are not sufficient for one of ordinary skill in this field to realize the present invention without lengthy research and independent conception. Research Disclosure 36,015, April 1994, pp. 191-193, does not disclose the relative volatilities between HFC-32 and any of CFC-12, CFC-115 and HFC-125 in the presence of any of the presently claimed extractive agents. Relative volatilities of the combination of HFC-32 with other compounds are not predictable but through experimentation and are required for one of ordinary skill in the art to determine if a specific extractant will perform a desired separation. Thus, the present claims 1-4 are not rendered obvious by Research Disclosure 36,015, April 1994, pp. 191-193.

Re: "Claims 1-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mahler et al in view of EP'362."

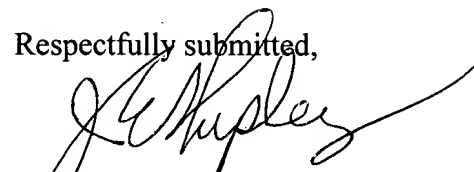
"EP'362" is European patent application publication EP 0 626 362 A1.

As discussed in detail *supra*, Mahler et al. discloses separating HFC-143a from certain impurities, including CFC-115, HFC-125, CFC-12, HCFC-1113 and HFC-32 by extractive distillation using an alcohol extractive agent (Mahler et al, col. 4, lines 13-22). EP'362 discloses separating HFC-125 from CFC-115 by extractive distillation using "an extracting reagent having a standard boiling point ... in the range of from -10°C to 100°C and being selected from paraffinic hydrocarbons, alcohols, ethers, esters, and ketones." (EP'362, page 2, lines 35-37). Mahler et al., and Mahler et al. in view of EP'362 are silent as to claim 1 of the subject application, which relates to separating HFC-32 from a halocarbon selected from the group consisting of CFC-12, CFC-115, and HFC-125 using certain alcohol, hydrocarbon, ketone

or chlorocarbon extractive agents. At the time the present invention was made, there was no suggestion or motivation to modify the teachings in Mahler by any teaching in EP'362, and even if so done, one does not arrive at or near to the presently claimed separation of HFC-32 from CFC-12, CFC-115 or HFC-125 by extractive distillation using the claimed extractants, much less arrive at any reasonable expectation that such an extractive distillation would be successful. The teachings of Mahler et al. in view of EP'362 are not sufficient for one of ordinary skill in this field to realize the present invention without lengthy research and independent conception. Mahler et al. in view of EP'362 does not disclose the relative volatilities between HFC-32 and any of CFC-12, CFC-115 and HFC-125 in the presence of any of the presently claimed extractive agents. Relative volatilities of the combination of HFC-32 with other compounds are not predictable but through experimentation and are required for one of ordinary skill in the art to determine if a specific extractant will perform a desired separation. Thus, the present claims 1-11 are not rendered obvious by Mahler et al. in view of EP'362.

In view of the foregoing, allowance of the above-referenced application is respectfully requested.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'J. Shipley', written over the typed name.

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